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Jungmann, Robert; Baur, Nina; Ametowobla, Dzifa

Grasping Processes of Innovation Empirically. A Call for Expanding the Methodological Toolkit. An Introduction

Robert Jungmann, Nina Baur & Dzifa Ametowobla[*]

Abstract: »*Innovationsprozesse empirisch erfassen. Ein Plädoyer für die Erweiterung des Methodenspektrums*«. During the past decades, innovation research has yielded countless empirical studies in a variety of disciplines. For all this quantity, we still lack an adequate understanding of basic qualities and mechanisms of its central subject. Which processes and conditions bring innovation about? How does it spread? And what is its genuine nature? Critics argue that these shortcomings have their roots in the conceptual limitations of established perspectives on innovation and in the fact that researchers confine themselves to studying technical and scientific novelties or marketable products. This self-restriction stands in marked contrast to the observation that innovation plays an important role in contemporary societies. The term is at least ubiquitous and its usage common in all societal fields. In the introduction to this HSR Special Issue, we subscribe to this critique and argue that the conceptual reductionism comes along with severe methodical and methodological limitations. These become manifest in a joint dominance of quantitative indicator-based research and ethnographic single case studies. Thus, researchers of innovation disregard a variety of possible data types and forms of analysis and rarely apply complex designs. It is also not common to consider the combination of multiple types of data and analysis in mixed methods approaches. The most serious issue, however, is that mainstream innovation research remains ignorant of a multitude of potential research questions and thereby loses sight of whole areas of interest. An overview of the empirical studies in this HSR Special Issue shows that the range of methods used is wider at the edges of the field of research. In order to relate these methods to each other and to the theoretical foundations of innovation research, we suggest a middle-range debate on methodology.

Keywords: Innovation, methods, methodology, research designs, case studies, mixed methods, indicators, systems of innovation, STS, social innovation.

[*] Robert Jungmann, Department of Sociology, Technical University of Berlin, Fraunhoferstraße 33-36 (FH 9-1), 10587 Berlin, Germany; robert.jungmann@tu-berlin.de.
Nina Baur, Department of Sociology, Technical University of Berlin, Fraunhoferstraße 33-36 (FH 9-1), 10587 Berlin, Germany; nina.baur@tu-berlin.de.
Dzifa Ametowobla, Department of Sociology, Technical University of Berlin, Fraunhoferstraße 33-36 (FH 9-1), 10587 Berlin, Germany; dzifa.ametowobla@tu-berlin.de.

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1. Innovation: An Old, New and (for now) Disciplinary Divided Research Field[1]

One can doubtlessly say that innovation is an old area of social research. Over the years, different disciplines have produced a large number of studies on a host of instances of the phenomenon generally labelled "innovation." In the last four decades, research on innovations was dominated by a focus on commercialised invention based on the theoretical conceptions of Schumpeter and Freeman. Both of them were extremely important scientific entrepreneurs in highlighting innovations as specific and relevant phenomena. As a result, innovation studies today is regarded as a field of research in its own right (Godin 2012). Scholars in this field use different methods, ranging from social network analysis (SNA) (e.g. Coleman et al. 1957), uni-, bi- and multivariate statistics (e.g. Freeman 1995), and interviews (e.g. Dougherty and Heller 1994) to ethnographies (e.g. Hoholm and Araujo 2011).

If we look at this longstanding tradition of empirical work more closely, it becomes apparent that most of it is conducted within the fields of Science and Technology Studies (from hereon STS), economics and economic geography. For the latter, the subject is even a constituting issue (Bathelt 2005; Bathelt and Gückler 2012). On the one hand, studies on innovation are deeply embedded in the disciplinary debate and discourse on the institutional areas that they observe. On the other hand two typical theory/method bundles or complexes (Clarke 2005) emerged across these debates in different disciplinary fields: ethnographies of innovation, evolving mainly from STS, and (national, regional, territorial) systems of innovation research in regional economics and economic geography.[2] However, these methodological debates are strangely detached from both the general debate on social science methodology (Behnke et al. 2010; Baur and Blasius 2015a) and the debates on process-oriented methodology (Baur and Ernst 2011), longitudinal research (Baur 2005) and methods of historical sociology (Baur 2008a; 2009a), that have been – among other places – conducted in prior issues in this journal (for a summary, see Baur 2009b).

[1] The paper is influenced by the methodological debates in the DFG Graduate School "Innovation Society Today" as well as the conference "Methods of Innovation Research" we organised in Berlin on October 16th and 17th 2014. We want to thank all participating scientists and Cornelia Thierbach for their helpful suggestions.

[2] We are aware that there are some substantial lines of research that do not fit into this dualism, like evolutionary (e.g. Dosi 1983; Geels 2004), network (e.g. Owen-Smith and Powell 2004; Padgett and Powell 2012; Baur 2015), historical/reconstructive (Van de Ven et al. 1999) or path-theoretical (David 1994; Arthur 1994; Sydow et al. 2012b) approaches. All these approaches are highly relevant for the field, but did not yet initiate a whole theory/method bundle nor spread to studies in all institutional areas.

This is even more surprising, as these debates seem highly relevant for the field of innovation research (and vice versa).

Thus, our hypothesis motivating this HSR Special Issue is that the dominance of these deeply institutionalised agendas within the research field on innovation hamper an adequately broad theoretical and methodological access to the complex processes that are characteristic for innovation. With this HSR Special Issue, we want to take a first step towards integrating these distinct methodological debates as well as suggest methodological alternatives to classical ethnographies of innovation as well as indicator-based systems of innovation research to provide a broader empirical base for substantial theorizing about innovation.

In the theoretical debate, we can find such a movement towards a broader understanding of innovation. Even though there is a very old tradition of innovation theory, the topic has been rediscovered in the last years. Beyond the traditional fields of research on innovation, there are contributions towards a conceptual foundation of a comparative, cross-disciplinary field of innovation studies independent of specific institutional areas (Zapf 1989; Barley 1990a; Garud and Karnøe 2001; Geels 2004; Braun-Thürmann 2005; Schubert and Windeler 2007; Stark 2011; Rammert 2010; Hutter et al. 2015; Howaldt and Jacobsen 2010; Howaldt and Schwarz 2010; Sydow et. al. 2012b; Besio and Schmidt 2012; Knoblauch 2014; Baur 2005; Besio and Jungmann 2015; Rammert et al. 2015). These contributions from different disciplinary and theoretical backgrounds mainly argue in three interrelated lines that future research should:

1) study *innovation as a social form in its own right*. Innovations are not only limited to being processors of market dynamics or epistemic activities.
2) move *beyond the thematic focus on scientific, technological or economic innovations*, to study fields like education (Bormann 2010) or arts, where social innovations appear (Zapf 1989; Schubert 2014).
3) *compare processes in different areas* to come to an overall picture of innovation, to grasp the socio-logic of innovation (Braun-Thürmann 2005).

Following this emerging line of research, we discuss methodological implications of such a demanding enterprise in this HSR Special Issue. To move beyond the two dominant complexes of research, we have to expand not only the theoretical but also the methodological toolkit for research practice. Studies of innovation could use the whole range of social science methods, i.e. both qualitative approaches (e.g. Flick 2014), quantitative approaches (e.g. Baur 2009b; Bulmer 2004; Wolf and Best 2010) and mixed methods approaches (e.g. Bryman 2006; Creswell and Plano Clark 2006) in order to deepen the empirical base of the field of research. A methodological debate about innovation studies therefore has to discuss specific possibilities and problems of specific types of data ("*Datensorten*"), data collection, data analysis and of linking theory and data (Baur 2009a) that arise while researchers try to grasp patterns in innovations as specific processes of social change.

The constituting assumption of such a debate is that specific forms of social processes require specific strategies to grasp them adequately (Baur 2005, 2008b, 2009a). After a short discussion of the shortcomings of the dominant theory/methodology complexes, we will introduce a few helpful concepts to focus on characteristics specific to processes of innovation. They are shared understandings of the contributions the approach of comparative innovation studies described above can make towards a more complete view of innovation in research. This theoretical beginning sets the scene for a methodological frame for the emerging field of research on comparative innovation studies in which we want the contributions of this HSR Special Issue to be embedded.

2. Dominant Theory/Method Complexes and their Shortcomings

As we have stated above, we can identify two dominant lines in research: *systems of innovation* (e.g. Freeman 1995; Cooke 2001) and *ethnographies of innovation* (e.g. Vinck 2003; Hoholm and Aruja 2011). As these lines have almost contrary approaches to the topic, we compare them on two main dimensions – the level of abstraction from which they observe innovations and the theories they use to create knowledge out of data. Adapting Richard Feynmans *bon mot* on nanotechnology to innovation research we want to argue that there is plenty of room in between.

2.1 Level of Abstraction: Indicators vs. Thick Descriptions of Innovation

Ethnographies and systems of innovation approaches completely differ in what they call "innovation" in their research practice. In the *systems of innovation approach*, researchers never observe processes of innovation in a direct manner. Instead, they work with *indicators of newness*, often patent rates or R&D expenditures. These indicators have their own performativity. Patents, as the most common example, are one result of specific processes which link the field of science and technology to the economy. However, using patents as indicators implies measuring innovation via a phenomenon which is related to innovation but by no means identical with it: Not every innovation process can be patented. Thus patents only point to a specific detail of the broader picture of innovation. On the other hand there are many patents that neither describe any kind of invention nor in any form reach any market. In many cases, patents do not indicate innovation at all but manifest a specific form of competitive behaviour. Researchers use such *abstractions from concrete processes to identify patterns in the correlations of these indicator variables with independent variables*. In the case of systems of innovations research, these variables often

cover differences in education or funding in regions or states. The restriction to easily quantifiable indicators opens up the way for statistical causal analysis, but pays a high price in strict control of explicatory variables.

In contrast to this, *ethnographic field studies* neglect such abstractions. Often having an explicit background in ethnomethodology, they want to *explore the prerequisite-ridden aspects of the specific innovation process*. For example the famous innovation studies of Actor-Network Theory (ANT) try to follow human and non-human actors (Latour 2005) to open up the black box of the highly contingent trajectories that lead towards innovation. These studies often result in thick descriptions (Geertz 1994) of a single case. By doing so, they run into what Siebenhüner (2007) terms the paradox of empirical research on innovation: Authors discuss production of newness as unique, but, as social scientists, they also have to explore patterns and regularities in them. This is exactly the same methodological problem between singularity and generalization that case study research (Baur and Lamnek 2005) is trying to tackle on a more general methodological level. As ethnographies of innovation tend to focus on singularities, they tend to identifying contingencies in processes, but often lack focus on patterns.

As we can already see from this short discussion, concerning research design, innovation studies tend to *lack the balance between adequate abstraction from and focus on uniqueness in processing newness*.

2.2 Concrete Hypothesis vs. Listening to Ethnotheories of Innovations

The contrast between these two complexes can also be found in the relationship of theory and data. *Systems of innovation studies* start *deductively* with clear hypotheses, as it is common in the quantitative paradigm (Baur and Blasius 2015b). Researchers tend to identify innovations mostly via indicators used in former studies (Bormann 2012) or theoretical foundations mostly reaching back to the work of Schumpeter (Smith 2005). Changes in these indicators of innovations are correlated to explicatory variables, which are theoretically selected as well.

Ethnographies of innovation on the other hand identify innovations *inductively*. As it common in qualitative research (Baur and Blasius 2015b), research tend to use *invivo codes*, i.e. the labels that actors in the field of research assign to phenomena they witness. Since the processes that surround these phenomena are black boxed by success and daily use, these authors depend on ethnotheories of the (human) actors involved to make elements of these processes visible. Again in sharp contrast to the studies in systems of innovation research, ethnographers of innovation tend to follow not just the actors, but also their ethnotheories of innovation (Schulz-Schaeffer 2008). Besides the studies in ANT and STS, the theoretical foundation of sociology of innovation by Braun-Thürmann (2005) is a good example of such a definition of innovation that completely depends on the interpretations within the field of research. For

Braun-Thürmann, an innovation is a symbolic or material artefact that an observer defines as new and experiences as improvement compared a former status. If one follows this definition, everything that is discursively constructed (Besio and Schmidt 2012; Knoblauch 2014) and labelled as innovation by the observer in the field has to be studied as such.

While there is no theoretical resistance to thick descriptions, systems of innovation research simply defines innovations through sets of variables in a very concrete and restrictive way. In the relationship of theory and data, research on innovation also *lacks a balance between inductive voluntarism and deductive reductionism*. Empirical research with a clear theoretical perspectivity (Weber 2004; Kalthoff et al. 2008; Baur 2008b; 2009a), aiming at building substantial theories, is still an exception in this field of research (for the divide towards formal theorizing see Glaser and Strauss 1968).

2.3 The Narrow Empirical Aisle of Dominant Innovation Studies

The above discussion of two central methodological decisions in the dominant strains of innovation studies shows that research tends to focus on a *dualism between deductive macro- and inductive micro-analysis*. We see this twofold focus as problematic because it spans a narrow empirical corridor in which studies of innovation have to be situated to get recognised as such by the research community. The result is a methodological self-restriction of the researchers in the field that is rooted in institutionalised theory/method schools and a disciplinary divide. Thereby many theoretical and methodological resources remain unused. Focusing on methods, we can identify a minimum of six shortcomings of current research practice:

1) *Narrow range of data:* Within the described bundles of innovation research there is, on the one hand, a strong focus on participant observations (Thierbach and Petschick, 2015) and qualitative interviews (Helfferich 2015) which results from an ethnographic background (Fetterman 1998; Knoblauch 2005) and, on the other hand, a dominance of classical surveys (Bulmer 2004), with the exception of some relational data-sets (see e.g. Owen-Smith and Powell 2004). Many forms of data, like process-produced data (Baur 2009b), video data (Knoblauch and Schnettler 2006), focus groups (Vogl 2015), narrative interviews and life histories (Küsters 2015) or panel survey data (Schupp 2015) are not used in this field, although they are main data sources in other thematic areas of the social sciences.
2) *Lack of complex, mixed methods research designs* (e.g. Bryman 2006; Creswell and Plano Clark 2006): Mostly these studies operate with simple research designs using observations, interviews or survey data only (for an exceptions see Barley 1990b).
3) *Lack of longitudinal studies:* Although history and historical sociology could be two important sources for theories and methods, historical methods

and methods of historical sociology (for an overview see Baur 2005; 2008a) are not relevant in the discussion yet (for exceptions see Rammert 1993; Van de Ven et al. 1999; Sydow et al. 2012a).

4) *Lack of comparative studies:* Comparative sociology and similar subjects could also be a useful field to look at for scholars in innovation studies. Comparisons are mostly drawn between regions or nations as black boxed, spatial containers only, similar to the way cross-cultural survey research does (Baur 2014) but not on the way suggested by current spatial research (Baur et al. 2014). Studies which rely on other dimensions of comparison are rare exceptions (see e.g. Knie 1991 contrasting successful and not successful innovations). The potential of a comparative, empirical field of research on innovations remains untapped.
5) *Neglect of multi-level dynamics:* The divide between micro- and macro-studies leaves the everyday interaction between both levels aside. This is counterfactual to theoretical qualifications of distributed innovation (e.g. in Garud and Karnøe 2001, Rammert 2012).

All these shortcomings are accompanied by aforementioned problems in (in terms of Glaser and Strauss 1968) empirically grounded, substantial theorizing about patterns in processes of innovation in both areas of research: Economics as well as Science and Technology Studies.

3. Innovation as Specific Form of Social Change

Before we can discuss a methodological frame to deepen the debate on innovation empirically, we have to explain our specific understanding of the central term "innovation." As indicated above, we base our definition on a broad conception of innovation which is in line with classical understandings like that of Gilfilian (1935) and Ogburn (1922) as well as the recent publications mentioned in section 1 above. Instead of restricting the term "innovation" to scientific or technological progress with relevance to economic activities, we understand it as specific type of social change, a focus that was lost in favour of the often normative and restricted conception prevalent in contemporary innovation studies. Although the specificity of this change is still a question to be inquired empirically, we can pick two dimensions in which we can conceptualise the socio-logic of innovation processes.

Firstly we want to follow Hutter et al. (2015, in this HSR Special Issue), who analytically distinguish three *perspectives on innovations* that enable researchers to observe differences from other processes of social change:

1) *Pragmatics of Innovation:* Innovation as a contingent and inherently uncertain process can be described out of a specific pragmatic dimension referring to concrete doings of individuals in the course of their daily life (see Tush-

man and Rosenkopf 1992 for a specific thesis on specialties). It can be understood only with reference to collectively anticipated futures (Schütz 1972, Popitz 2000). Its practical course is affected by imagination and prospects (van den Belt and Rip 1987).

2) *Semantics of Innovation:* Structural change in processes of innovation is observed specifically and connected with discourses, which often affect its course too. This means that processes of innovation are accompanied and influenced by semantics as specific patterns of meaning (for innovation as a specific reflection on social change see Pronzini et al. 2012; Besio and Schmidt 2012).
3) *Grammar of Innovation:* Processes of innovation are embedded in highly prestructured contextual infrastructures. That implies that they depend upon a specific set of grammatical rules and resources. This means that institutional combinations (Cooke 2001), material or spatial settings (Hess 2004) and fields with constellations of individual actors or organizations (Bourdieu 1985; DiMaggio and Powell 1983; Fligstein and McAdam 2012) simultaneously exert influence on innovation processes.

Furthermore, we have to describe innovations as multiply embedded processes in different ways. Following Baur (2005; 2008b), we can analytically divide *four spheres of embeddedness:*

1) *Analysis Levels:* Processes of innovation are often distributed, not only among many actors but also among multiple levels of action or systems. Mostly they are a multi-level phenomena involving frames of interaction, organization, networks, societal subsystems and so on.
2) *Action Spheres:* They are also ubiquitous processes (Zapf 1989; Braun-Thürmann 2005), which are not confined to economics or science and technology. Innovations occur in almost any institutional area, so that we can also speak of political innovations (Voß 2007) or innovations in education (Bormann 2010) for example.
3) *Time:* They are also embedded in time. Every process can only be understood in its historical position, in the light of its historicity (Giddens 1981). To analyse innovations always means to set an analytical cut into the stream of history, to extract episodes (Giddens 1984). This fact has to be reflected theoretically and methodologically.
4) *Space:* One main result of ethnographies of innovation is that they produce descriptions of its material and spatial embeddedness. This is a fact often forgotten, but of specific importance for situating them. Every material and spatial aspect is also a social one (Baur et al. 2014), because materiality and spatiality are always inherently interwoven with the historicity described before.

Every such innovation process is also deeply embedded in the *societal context of modernity*, which processes novelty in quality and quantity as it has never happened before in history (Luhmann 1995). Maybe we can even proclaim a

dispositive of creativity (Reckwitz 2012) or an *innovation society* (Hutter et al. 2015, in this HSR Special Issue). To understand how particular instances of innovation are related to a mode of regulation characteristic for contemporary societies, we have to situate innovation in a societal and multiply social context, e.g. to understand the specific reflexivity (Windeler 2003) at work in processes of innovation that is distinctive of late modernity. This is the specific focus which provides the conceptual foundations for the methodological debate that we intend to initiate with this HSR Special Issue.

4. A Framework for a Methodological Reflection on Innovation Studies

Such a broad understanding of *innovations* as *multiply embedded, specific processes of social change* suggests consequences for the methods applied. The tenet of a methodological debate on innovation research therefore is to reflect on how grasping and discovering patterns in these unique processes can be achieved in order to build substantial theories about it. The following pages introduce a heuristic framework for such a discussion which shows how many methodological resources the social sciences provide for such a complex project and highlights different research questions within innovation studies.

We can start by discussing principal suggestions of the three perspectives on processes of innovation introduced above and elaborated in the theoretical opening of this HSR Special Issue (Hutter et al. 2015, in this HSR Special Issue). A researcher's specific perspective on the (innovation) phenomenon makes a difference in every step of the research process and in every decision for a research design (Baur 2008b). A pragmatic perspective thus means focussing on doing innovation, a semantic one highlights recognizing, labelling and interpreting innovation, and a grammatical perspective implies inquiring into rule systems and regimes of power which drive or hinder innovation.

In Table 1, we show possible suggestions of this threefold analytical divide along three main decisions in research design: the selection of data sources, tools of data analysis and cases analysed/compared. Even if this picture is hardly a complete one and there is no need to reduce it to these examples, we can see typical methodological paths for each perspective.

What Table 1 also suggests is that we typically have to choose a mixed methods approach if we want to address more than one of these perspectives in a single empirical study. This is a fact often ignored in studies of innovation. Consequently, missing data and information often lead to massive over-interpretation and construction of scientific artefacts (see for a famous example Joerges 1999 response to Winner 1980).

Table 1: Perspectives on Innovation and their Methodological Suggestions

Perspectivity	Methodological Tools/Decisions
	Type of Data
Pragmatic	Observation, Video Data, Participative Methods (e.g. Group Discussions), Visual Data, Interviews
Semantic	Interviews, Process-Produced Data (e.g. Documents, Websites), Secondary Data (e.g. Books, Articles)
Grammatical	Standardised/Non Standardised Network Relational/Network Data, Survey Data, Interviews, Process-Produced Data (e.g. Laws, Codified Rules in Organizations)
	Data Analysis
Pragmatic	Ethnography (Classical , Focused, Longitudinal or Multi-Sited), Technography, Content Analysis, Videography, Visual Data Analysis, Hermeneutics
Semantic	Content Analysis, Discourse Analysis, Genre Analysis, Historical Semantic Analysis
Grammatical	Network Analysis, Uni-/Bi- and Multivariate Statistics, Content Analysis, Path Analysis, Analysis of Infrastructures
	Case Selection
Pragmatic	Comparison between different concrete contexts of action and interaction and interests of concrete actors involved
Semantic	Comparison between different historical or cultural complexes of signification and legitimation, like western/eastern reasoning within processes of innovation or legitimised forms of R&D in U.S., compared to France
Grammatical	Comparison between different institutional, relational or socio-material/spatial rule/resource-systems, e.g. different institutional areas like education and economics, or different regimes of law

Beyond these suggestions, we can also use this threefold framework for locating research questions. In order to make this point clearer, we locate the typical research designs used by current innovation research in the framework for process-oriented research suggested by Baur (2005). If we combine Baur's (2005) suggestions with the three observational schemes for innovation (see Table 2), we can categorize the broad range of research questions possible for innovation studies and visualize two points brought forth in the current discussion: Firstly, both of the dominant complexes in research discuss only a very specific section of phenomena relevant to innovation research. Secondly, relevant topics for the theoretical as well as methodological debate can be defined with reference to specific empirical questions. The twofold focus in innovation studies comes along with a restriction in research questions: Ethnographies of innovation are typically used to identify and explore patterns in doing innovation whereas systems of innovation research argues to analyse causal influence of laws or political instruments enabling or hindering a specific effect: innovation. Table 2 suggests that there are quite a lot of objectives for research beyond these dominant lines.

In order to grasp these processes adequately in line with these new, mostly formal theories in innovation research, we need both: complex research designs, combinations in forms of data and data analysis as well as empirically grounded substantial theorizing. Each study also has to declare which dimension or combinations of dimensions the researcher focuses on. In such an enterprise the framework above cannot only show us possibilities to overcome the presented shortcomings. It also shows possible dimensions in which single-case and comparative studies could provide important insights from types of data, tools for analysing and research designs beyond the common paradigms.

Table 2: Methodological Location of Research Questions

Research Objective	Pragmatic	Semantic	Grammatical
Description			
Identification of Social Patterns	Ethnographies of Innovation		
Characterisation of Social Patterns			
Classification/Typification of Social Patterns			
Causal Analysis			
Causes (stabilising/destabilising factors)			Systems of Innovation Research
Effects			
Classification/Typification of Causes/Effects			

In this HSR Special Issue, we present methodical and methodological articles that move beyond this thin aisle in data sources, tools of data analysis, research designs and research questions. The studies at hand discuss one of the following dimensions in their functionality and problems for grasping processes of innovation in a more complex way as has been done so far. The studies at hand discuss one of the dimensions listed in Table 3 in their functionality and problems for grasping processes of innovation in a more complex way as has been done so far.

Table 3: Methodical and Methodological Approaches used in this HSR Special Issue

	Approaches
A	Unconventional Methodology and Designs *(esp. Naber, Petschick, Reischauer, Stubbe)*
B	Different Types of Comparison *(esp. Laux, Stubbe)*
C	Mixed Methods Approaches *(esp. Gläser and Laudel, Bund et al., Reischauer, Roth)*
D	New Types of Data, Data Analysis and Case Selection in Innovation Research *(esp. Altmann, Engelhardt, Gläser and Laudel, Laux, Noack, Ohlhorst and Schön, Roth)*
E	New Ways of Linking Theory and Methods for Grasping Aspects of Innovation not Discussed Yet *(esp. Altmann, Engelhardt, Bund et al., Ohlhorst and Schön)*

5. Alternative Approaches Presented in this HSR Special Issue

We can relate these dimensions to the methodological studies in this HSR Special Issue. Every article focuses on at least one of these points and therefore breaks in a way with the common theory/method complexes in innovation research.

In the first paper, *Michael Hutter, Hubert Knoblauch, Werner Rammert* and *Arnold Windeler* elaborate on a comparative framework for studying fields of innovation in order to specify the hypothesis of a changing innovation society. With this change the production of innovation as well as the typical modes of coordination in it have become reflexive. Furthermore they provide us with an understanding of innovation as specific form of social change and present the idea of societal innovations as processes that could be labelled as innovation with reference to multiple logics beyond economic, scientific or technical rationality. After this extended introduction to the conceptual program in innovation studies this HSR Special Issue wants to put forward in its methodical dimension, we can present alternatives to both dominant lines described above in (1) quantitative approaches, (2) comparative designs, (3) discourse analysis, (4) ethnography, (5) action research and related methods and (6) mixed methods approaches.

5.1 Quantitative Approaches

The contribution of Bund et al. presents an approach that extends the use of standardised data (QUAN data) beyond the established systems of innovation research. With their work on indicators for social innovativeness, *Eva Bund, Ulrike Gerhard, Michael Hölscher* and *Georg Mildenberger* focus on a form of social change outside the classical fields of technoscience and economy. They connect to the systems of innovation research by analysing established metrics for techno-economical innovations and asking how these can be extended or adapted to innovation processes outside the field of economics. The contribution links existing theories of social innovation to the methodological debate on quantitative measurement of economical innovativeness. Additionally, it introduces a mixed methods design for the validation of the proposed indicators. Starting from the observation that innovativeness depends on the interaction of dynamics on multiple levels of society, the article also introduces considerations on how to break down global or national as well as aggregate local or regional indicators for innovativeness.

5.2 Comparative Designs

The following two papers discuss new approaches to comparison in innovation research. While both fit our call to present methods for the space between

large-scale macro- and single-case micro-level studies, each can be seen as an answer to shortcomings in one of these strands.

With his article on qualitative comparative analysis in innovation research, *Thomas Laux* shows what innovation research has to gain when scholars look for methods off the beaten track. As a method which bridges the divide between the qualitative and quantitative paradigm, Qualitative Comparative Analysis (QCA) combines a comparative and case-oriented approach and enables researchers to explore context conditions for innovation in middle-sized samples. By comparing the introduction of equal pay regulations in 52 countries, Laux presents his method as a way to analyse and qualify the institutional conditions of innovations on the one hand and to select extreme or typical cases for more process-oriented qualitative case studies on the other hand.

Julian Stubbe's article approaches the problem of comparison from the bottom up in two respects. Firstly, he works from an STS perspective and shares the established conviction that innovation processes can be understood adequately only by in-depth ethnographic research, albeit not in single-case studies. Secondly and more importantly, Stubbe focuses his methodological discussion on a basic question of research on innovation as a social process: How can we identify, much less compare, something that is still becoming while we observe? The answer presented in this article is an unconventional design to construct heuristics via a permanent comparison of similarities across sites. The exemplary research project focuses on the importance of material practices and stories in the construction of differences between present and past that distinguishes objects as novelties. Honouring preceding discussions in ethnography as well as STS, Stubbe emphasizes the role of the researcher in this process as participant and reference point for actors during the ethnographic data collection as well as by his decisions during data analysis.

5.3 Discourse Analysis

Novelty is but one of the determinants unanimously connected to innovations. The other is improvement. This designates practices of (e)valuation as one fruitful subject of innovation research. *Anina Engelhardt* investigates these practices in contemporary arts and introduces discourse analysis as another method transfer into innovation research. The presented sociology of knowledge approach to discourse analysis (SKAD) relies on data types and forms of data collection established in ethnographies of innovation but differs from these in data analysis where researchers draw on concepts from social theory in a specific way to make sense of their subject.

While Engelhardt uses discourse analysis to shed light on the pragmatics as well as the semantics of innovation, the contribution from *Phillip Altmann* shows that discourses in themselves can be a subject of innovation research. In his article, Altmann discusses how the notion of "*Sattelzeit*," which denotes a

prolonged period of radical conceptual change in historical social research, can be disengaged from the focus on large-scale social changes and extended to the research of middle- and short-range changes in discourse. The ensuing generalised method of concept-centred discourse analysis is applied in a study of discursive innovation in Ecuadorian politics.

5.4 Ethnographic Approaches

While the introduction of discourse analysis into innovation research extends the stock of methods used in this field regardless of methodical peculiarities, established approaches like ethnography offer scope for specification and discussion as well. The contributions of Noack and Petschick bear evidence of this fact.

Anika Noack focuses on the stage of data analysis and demonstrates how hermeneutics can profitably be used to shed light on the genesis of innovative ideas. The meticulous examination of group conversations in which new ideas are negotiated shows that actors use specific communicative forms to elevate or devaluate ideas. This in-depth view into the earliest stages of innovation unearths restrictive patterns of communication which unobtrusively curtail processes designed specifically to foster creativity and openness. Hermeneutical interpretation thus suggests itself as a method for analysing conditions of innovation processes that are disguised to actors and superficial observers alike.

Alternative forms of ethnography are not necessarily directed to adding more detail to already thick descriptions. The ethnographic panels presented by *Grit Petschick* extend the span of time covered by an ethnographic study without increasing the amount of time the researcher spends in the field proportionately. In her example Petschick accompanied a team of scientists for several years and was able to investigate the complete development process of an important scientific innovation and especially the interpretations accompanying it. The proposed method of ethnographic panels complements qualitative interviews strategically with regular visits to the field sites. By the skilful arrangement of interviews and observations the possible scope of a study is expanded far beyond the usual bounds of a one-person ethnography. At the same time, the researcher is able to retain the main advantages of her method, to wit, strong trust relations with actors in the field and an in-depth understanding of their views combined with a personal perspective on the processes at hand. The contributions of Stubbe, Noack and Petschick show that there is much potential to specify established methods of innovation research to fit a wider range of research questions.

5.5 Action Research and Related Methods

Ethnography is not the only approach introduced in this HSR Special Issue that relies on a close relationship of researchers and actors in the field. With action research, scientists leave their accustomed role of disinterested observer behind and take an active part in the innovation processes they investigate. This posi-

tioning of the researcher reflects a situation that is common in innovation studies for two reasons. Firstly, some of the dominant disciplines in this field are based on a constructionist relation to their research object. Secondly, research on processes of innovation is often done and needs to be done together with practitioners who explicitly want to gain knowledge about what they are doing.

Annika Naber discusses how researchers can use the qualitative-heuristic methodology in organisations to uncover implicit structures in processes of organisational innovation. The presented approach uses qualitative experiments in the field to create irritation in the course of problem solving. The combination of directed intervention and continuous dialogue with practitioners enables the researcher to inquire into the conditions of the processes she participates in. In this approach, participation acts as a vehicle to ensure a close connection between theory and data. Thereby the qualitative-heuristic methodology refines Strauss' and Corbin's strand of grounded theory in a direction that underlines a constructionist claim of innovation research, namely that its results inform practitioners and thereby help to foster creative problem solving.

Another approach that can be used to support ongoing innovation processes as well as advance the understanding of past ones is presented by *Dörte Ohlhorst* and *Susanne Schön*. In their constellation analysis, the researchers from different disciplines try to capture all factors that influence the innovation process, be they social, technical or natural, and classify their relations by way of discourse with and between the participants. The discourse results not only in the constellation, which is a comprehensive description of the innovation process and its conditions. It also enables practitioners from different disciplines to understand each other's perspectives on the project and allows them to develop joint strategies. Thus, the methodology transforms basic assumptions of ANT into a tool for inter- and transdisciplinary research on innovation and process support.

5.6 Mixed Methods Approaches

The final three contributions of the HSR Special Issue are focused on mixed methods approaches (Bryman 2006; Creswell and Plano Clark 2006). *Georg Reischauer* brings forward the methodological problem of how to grasp the meaning that organisations assign to the concept of innovation. Based on the assumption that this meaning is primarily located in tacit knowledge, he defines four dimensions to measure innovation as well as the organisational context that shapes its understanding. Data collection is comprised of separate strands of observations, interviews and artefact analysis. Results are combined during data analysis to an integrative category system. The introduced method mix is embedded in a case study design and thus predominantly directed towards the analysis of single organisations in all fields of society.

In contrast to this, the contribution of *Jochen Gläser* and *Grit Laudel* is tailored to research on scientific innovations. In their article on research trails,

they present a sophisticated method combination they developed to reconstruct scientists' research biographies and link them to the dynamics of scientific fields. The method centres a visualisation of the results of bibliometric analysis. This visualisation acts as stimulus and reference point for qualitative interviews during data collection and constitutes a data source in its own right during data analysis. The contribution of Gläser and Laudel shows how new method combinations allow researchers to tackle difficult basic questions of research on scientific innovation empirically. By using research trails as focus and complement for interviews, they are able to locate thematic turns in a scientist's career and thus identify the starting point of scientific innovations.

This starting point is the exclusive focus of the last article in this HSR Special Issue. *Philip Roth* presents a method designed to shed light on the dynamics of the social networks that are deemed crucial for knowledge transfer in the early phases of innovation. Through a combination of standardised diaries for self-observation and expert interviews he proposes to investigate the development of idea-related interactions that allow new knowledge combinations and inspire the application of existing solutions to new problems. By assigning the task of observation to the actors themselves and inquiring into the details of their interactions in well-timed interviews, the proposed method combination minimizes the space-time and retrospection problems that afflict prevailing forms of qualitative data collection in innovation research. The mix of standardised and open methods brought forward in Roth's contribution extends the toolkit of qualitative network research with an approach that is appropriate to its practice-theoretical foundations but less prone to major distortions than established forms of data collection.

The contributions in this HSR Special Issue endorse our claim that there is scope for a debate on methods and methodology in innovation research beyond the question of single-case ethnography or large-scale comparison of indicators. Scholars in innovation research apply qualitative, quantitative and mixed method approaches, tailor ethnographies, indicators or interviews to the specifics of their subject, borrow methods from distant fields and reflect on the effects of their research on the investigated processes.

6. Innovation Studies: On its Way to a Middle-Range Methodology?

The present collection offers but a glimpse of the variety of methods used in our field. To bring this variety to the fore is the first step in our endeavour to broaden the perspective on innovation currently taken by social science research. The next step in the methodical and methodological debate we want to start would be to relate these methods systematically to subjects, questions and problems of research on processes of innovation in different societal fields.

Against the opposing theory/method complexes we would like to debate a methodology for innovation studies with a clear perspective informed by social theory, but open minded and sensitive for to the suggestions and tales of the field (van Maanen 2011). We argued that Innovation Studies as an emerging, cross-disciplinary research field neither needs another case study nor another co-relation that indicates regions or states to be more innovative because of factor x or y. Instead we drafted a methodological framework that not only shows shortcomings, but also helps to locate typical and discover open research questions in innovation studies. Our main objective is to start a debate on the methodological consequences of a broad understanding of innovation as a specific form of social change that complements the emerging theoretical movement presented in this introduction.

Last but not least, we want to raise the question whether the expanding research field of innovation studies stands to benefit from a middle-range methodological debate (see Hine 2007 for science and technology studies). Such a debate would relate typical research questions and problems to types of data, tools of data analysis, research designs and so on. The discussions provided here might be a step towards such a conception, known in different areas like path analysis (Sydow et al. 2012a), spatial analysis (Thierbach et al. 2014) or even the debate on reflexive modernity (Layder 1998). Research practice and methodological debate in the future have to show if innovation research can (and should) proceed in this direction.

Special References

Contributions within this HSR Special Issue
Methods of Innovation Research:
Qualitative, Quantitative and Mixed Methods Approaches

Altmann, Philipp. 2015. Studying Discourse-Innovations: The Case of the Indigenous Movements in Ecuador. *Historical Social Research* 40 (3): 161-84. doi: 10.12759/hsr.40.2015.3.161-184.

Engelhardt, Anina. 2015 The Sociology of Knowledge Approach of Discourse Analysis in Innovation Research: The Case of Evaluation in Contemporary Fine Art. *Historical Social Research* 40 (3): 130-60. doi: 10.12759/hsr.40.2015.3.130-160.

Gläser, Jochen, and Grit Laudel. 2015. A Bibliometric Reconstruction of Research Trails for Qualitative Investigations of Scientific Innovations. *Historical Social Research* 40 (3): 299-330. doi: 10.12759/hsr.40.2015.3.299-330.

Hutter, Michael, Hubert Knoblauch, Werner Rammert, and Arnold Windeler. 2015. Innovation Society Today. The Reflexive Creation of Novelty. *Historical Social Research* 40 (3): 30-47. doi: 10.12759/hsr.40.2015.3.30-47.

Laux, Thomas. 2015. Qualitative Comparative Analysis as a Method for Innovation Research: Analyzing Legal Innovations in OECD Countries. *Historical Social Research* 40 (3): 79-108. doi: 10.12759/hsr.40.2015.3.79-108.

Mildenberger, Georg, Ulrike Gerhard, and Eva Bund. 2015. A Methodological Framework to Measure Social Innovation. *Historical Social Research* 40 (3): 48-78. doi: 10.12759/hsr.40.2015.3.48-78.

Naber, Annika. 2015. Qualitative Experiment as a Participating Method in Innovation Research. *Historical Social Research* 40 (3): 233-57. doi: 10.12759/hsr.40.2015.3.233-257.

Noack, Anika. 2015. Hermeneutical Interpretations in Ethnographies of Innovation. From New Ideas to Social Innovations. *Historical Social Research* 40 (3): 185-209. doi: 10.12759/hsr.40.2015.3.185-209.

Ohlhorst, Dörte, and Susanne Schön. 2015. Constellation Analysis as a Means for Interdisciplinary Innovation Research. *Historical Social Research* 40 (3): 258-78. doi: 10.12759/hsr.40.2015.3.258-278.

Petschick, Grit. 2015. Ethnographic Panels for Analyzing Processes of Innovation. *Historical Social Research* 40 (3): 210-32. doi: 10.12759/hsr.40.2015.3.210-232.

Reischauer, Georg. 2015. Mixing Artefact Analysis, Interviews and Observation to Inquire into the Meaning of Innovation in Organizations. *Historical Social Research* 40 (3): 279-98. doi: 10.12759/hsr.40.2015.3.279-298.

Roth, Philip. 2015. Including the Diary-Method in the Investigation of Practices Constituting Social Innovation Networks. *Historical Social Research* 40 (3):331-50. doi: 10.12759/hsr.40.2015.3.331-350.

Stubbe, Julian. Comparative Heuristics from a STS Perspective. Inquiring 'Novelty' in Material Practice. *Historical Social Research* 40 (3): 109-29. doi: 10.12759/hsr.40.2015.3.109-129.

References

Arthur, W. Brian. 1994. *Increasing returns and path dependence in the economy*. Ann Arbor: University of Michigan Press.

Barley, Stephen R. 1990a. The alignment of technology and structure through roles and networks. *Administrative Science Quarterly* 35 (1): 61-103.

Barley, Stephen R. 1990b. Images of imaging: Notes on doing longitudinal field work. *Organization science* 1 (3): 220-47.

Bathelt, Harald. 2005. Geographies of production: growth regimes in spatial perspective (II)-knowledge creation and growth in clusters. *Progress in Human Geography* 29 (2): 204-16.

Bathelt, Harald, and Johannes Glückler. 2012. *Wirtschaftsgeographie: ökonomische Beziehungen in räumlicher Perspektive,* vol. 8217. Stuttgart: Ulmer UTB.

Baur, Nina. 2005. *Verlaufsmusteranalyse*. *Methodologische Konsequenzen der Zeitlichkeit sozialen Handelns.* Wiesbaden: VS Verlag für Sozialwissenschaften.

Baur, Nina. 2008a. Was kann die Soziologie methodisch von der Geschichtswissenschaft lernen? *Historical Social Research* 33 (3): 217-248 <http://www.jstor.org/stable/20762308>.

Baur, Nina. 2008b. Taking Perspectivity Seriously. A Suggestion of a Conceptual Framework for Linking Theory and Methods in Longitudinal and Comparative Research. *Historical Social Research* 33 (4): 191-213 <http://www.jstor.org/stable/20762319>.
Baur, Nina. 2009a. Problems of Linking Theory and Data in Historical Sociology and Longitudinal Research. *Historical Social Research* 34 (1): 7-21 <http://www.jstor.org/stable/20762331>.
Baur, Nina. 2009b. Measurement and Selection Bias in Longitudinal Data. A Framework for Re-Opening the Discussion on Data Quality and Generalizability of Social Bookkeeping Data. *Historical Social Research* 34 (3): 9-50 <http://www.jstor.org/stable/20762373>.
Baur, Nina. 2014. Comparing Societies and Cultures. Challenges of Cross-Cultural Survey Re-search as an Approach to Spatial Analysis. *Historical Social Research* 39 (2): 257-91. doi: 10.12759/hsr.39.2014.2.257-291.
Baur, Nina. 2015. Netzwerkdaten. In *Handbuch Methoden der empirischen Sozialforschung*, ed. Nina Baur and Jörg Blasius, 941-58. Wiesbaden: Springer Fachmedien.
Baur, Nina, and Jörg Blasius, eds. 2015a. *Handbuch Methoden der empirischen Sozialforschung*. Wiesbaden: Springer Fachmedien.
Baur, Nina, and Jörg Blasius. 2015b. Methoden der empirischen Sozialforschung. Ein Überblick. In: *Handbuch Methoden der empirischen Sozialforschung*, ed. Nina Baur and Jörg Blasius, 41-62. Wiesbaden: Springer Fachmedien.
Baur, Nina, and Siegfried Lamnek. 2005. Einzelfallanalyse. In *Qualitative Medienforschung*, ed. Lothar Mikos and Claudia Wegener, 241-52. Konstanz: UVK.
Baur, Nina, and Stefanie Ernst. 2011. Towards a Process-Oriented Methodology. Modern Social Science Research Methods and Nobert Elias' Figurational Sociology. *The Sociological Review* 59 (777): 117-39.
Baur, Nina, Linda Hering, Anna Laura Raschke, and Cornelia Thierbach. 2014. Theory and Methods in Spatial Analysis. Towards Integrating Qualitative, Quantitative and Cartographic Approaches in the Social Sciences and Humanities. *Historical Social Research* 39 (2): 7-50. doi: 10.12759/hsr.39.2014.2.7-50.
Behnke, Joachim, Nina Baur, and Nathalie Behnke. 2010. *Empirische Methoden der Politikwissenschaft*. Paderborn: Ferdinand Schöningh.
Besio, Cristina, and Robert Jungmann. 2015, in print. Organisation und Innovation: Drei Thesen zum Passungsverhältnis zweier Formen der Moderne. *Soziale Systeme*.
Besio, Cristina, and Robert J. Schmidt. 2012. *Innovation als spezifische Form sozialer Evolution: Ein systemtheoretischer Entwurf*. Technical University Technology Studies Working Papers 3/2012. Berlin.
Bormann, Inka. 2012. Indikatoren für Innovation – ein Paradox? In *Indikatoren des Neuen. Innovation als Sozialmethodologie oder Sozialtechnologie?*, ed. Inka Bormann, René John and Jens Aderhold, 39-55. Wiesbaden: VS Verlag für Sozialwissenschaften.
Bormann, Inka. 2010. *Zwischenräume der Veränderung: Innovationen und ihr Transfer im Feld von Bildung und Erziehung*. Wiesbaden: VS Verlag für Sozialwissenschaften.
Bourdieu, Pierre. 1982. *Leçon sur la leçon*. Paris: Minuit.
Braun-Thürmann, Holger. 2005. *Innovation*. *Einsichten.* Bielefeld: transcript.
Bryman, Alan, ed. 2006. *Mixed Methods,* 4 vols. London: Sage.
Bulmer, Martin, ed. 2004. *Questionnaires*. 4 vols. London: Sage.

Clarke, Adele. 2005. *Situational analysis: Grounded theory after the postmodern turn*. Thousand Oaks: Sage.
Coleman, James, Elihu Katz, and Herbert Menzel. 1957. The diffusion of an innovation among physicians. *Sociometry* 20 (4): 253-70.
Cooke, Philip. 2001. Regional Innovation Systems, Clusters, and the Knowledge Economy. *Industrial and Corporate Change* 10 (4): 945-74.
Creswell John W., and Vicki L. Plano Clark. 2006. *Designing and Conducting Mixed Methods Research*. London: Sage.
David, Paul A. 1994. Why are institutions the 'carriers of history'?: Path dependence and the evolution of conventions, organizations and institutions. *Structural change and economic dynamics* 5 (2): 205-20.
Dosi, Giovanni. 1983. *Technical change and industrial transformation: The theory and an application to the semiconductor industry*. PhD diss., University of Sussex.
Dougherty, Deborah, and Trudy Heller. 1994. The illegitimacy of successful product innovation in established firms. *Organization Science* 5 (2): 200-18.
Fetterman, David M. 1998. Ethnography. In *Handbook of Applied Social Research Methods*, ed. Leonard Bickman and Debra J. Rog, 473-504. Thousand Oaks, London and New Delhi: Sage.
Fligstein, Neil, and Doug McAdam. 2012. *A theory of fields*. Oxford: Oxford University Press.
Geels, Frank W. 2004. From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory. *Research Policy* 33 (6): 897-920.
Flick, Uwe, ed. 2014. *The SAGE Handbook of Qualitative Data Analysis*. London, Thousand Oaks and Dehli: Sage.
Freeman, Chris. 1995. The 'National System of Innovation' in Historical Perspective. *Cambridge Journal of Economics* 19: 5-24.
Garud, Raghu, and Peter Karnøe. 2001. Path Creation as a Process of Mindful Deviation. In *Path Dependence and Creation*, ed. Raghu Garud and Peter Karnøe, 1-38. Mahwah, NJ: LEA.
Geertz, Clifford. 1994. Thick description: Toward an interpretive theory of culture. In *Readings in the philosophy of social science*, ed. Michael Martin and Lee C. McIntyre, 213-31. Cambridge: MIT Press.
Giddens, Anthony. 1981. *A contemporary critique of historical materialism*. London: Macmillan.
Giddens, Anthony. 1984. *Constitution of society: Outline on the theory of structuration*. Cambridge: Polity Press.
Gilfillan, S. Colum. 1935. *The sociology of invention*. Chicago: Follett.
Glaser, Barney G., and Anselm L. Strauss. 1968. *Time for Dying*. Chicago: Aldine.
Godin, Benoît. 2012. "Innovation Studies": The Invention of a Specialty. *Minerva* 50 (4): 397-421.
Helfferich, Cornelia. 2015. Leitfaden- und Experteninterviews. In *Handbuch Methoden der empirischen Sozialforschung*, ed. Nina Baur and Jörg Blasius, 559-74. Wiesbaden: Springer Fachmedien.
Hess, Martin. 2004. 'Spatial' relationships? Towards a reconceptualization of embeddedness. *Progress in human geography* 28 (2): 165-86.
Hine, Christine. 2007. Multi-Sited Ethnography as a Middle Range Methodology for Contemporary STS. *Science, Technology & Human Values* 32 (6): 652-71.

Hoholm, Thomas, and Luis Araujo. 2011. Studying innovation processes in real-time: The promises and challenges of ethnography. *Industrial Marketing Management* 40 (6): 933-39.
Howaldt, Jürgen, and Heike Jacobsen, eds. 2010. *Soziale Innovation: Auf dem Weg zu einem postindustriellen Innovationsparadigma*. Dortmunder Beiträge zur Sozialforschung. Wiesbaden: VS Verlag für Sozialwissenschaften.
Howaldt, Jürgen, and Michael Schwarz. 2010. *"Soziale Innovation" im Fokus: Skizze eines gesellschaftstheoretisch inspirierten Forschungskonzepts*. Bielefeld: transcript.
Tushman, Michael L., and Lori Rosenkopf 1992. Organizational determinants of technological-change-toward a sociology of technological evolution. *Research in Organizational Behavior* 14: 311-47.
Schütz, Alfred. 1972. *Gesammelte Aufsätze II. Studien zur Soziologischen Theorie.* Den Haag: Martinus Nijhoff.
DiMaggio, Paul J., and Walter W. Powell. 1983. The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review* 48 (2): 147-60.
Joerges, Bernward. 1999. Do Politics Have Artefacts? *Social Studies of Science* 29 (3): 411-31.
Kalthoff, Herbert, Stefan Hirschauer, and Gesa Lindemann, eds. 2008. *Theoretische Empirie*. Frankfurt a. M.: Suhrkamp.
Knie, Andreas. 1991. *Diesel – Karriere einer Technik: Genese und Formierungsprozesse im Motorenbau.* Berlin: Ed. Sigma.
Knoblauch, Hubert. 2005. Focused Ethnography. *Forum Qualitative Sozialforschung/Forum Qualitative Social Research* 6 (3) <http://www.qualitative-research.net/fqs-texte/3-05/05-3-44-e.htm>.
Knoblauch, Hubert. 2014. *Communicative Action, Reflexivity, and Innovation Society*. Technical University Technology Studies Working Papers 3/2014. Berlin.
Knoblauch, Hubert, and Bernt Schnettler, eds. 2006. *Video Analysis. Methodology and Methods*. Frankfurt a. M., et. al.: Peter Lang
Küsters, Ivonne. 2015. Narratives Interview. In *Handbuch Methoden der empirischen Sozialforschung*, ed. Nina Baur and Jörg Blasius, 575-80. Wiesbaden: Springer Fachmedien.
Latour, Bruno. 2005. *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.
Layder, Derek. 1998. *Sociological Practice: Linking Theory and Social Research*. London: Sage.
Luhmann, Niklas. 1995. *Gesellschaftsstruktur und Semantik. Studien zur Wissenssoziologie der modernen Gesellschaft,* vol. 4. Frankfurt a. M.: Suhrkamp.
Ogburn, William Fielding. 1922. *Social change with Respect to Culture and Original Nature*. New York: B. W. Huebsch, Inc.
Owen-Smith, Jason, and Walter W. Powell. 2004. Knowledge networks as channels and conduits: The effects of spillovers in the Boston biotechnology community. *Organization science* 15 (1): 5-21.
Padgett, John F., and Walter W. Powell. 2012. *The Emergence of Organizations and Markets*. Princeton: Princeton University Press.
Popitz, Heinrich. 2000. *Wege der Kreativität*, 2nd ed. Tübingen: Mohr Siebeck.

Pronzini, Andrea, Cristina Besio, and Robert J. Schmidt. 2012. Versprechen der Innovation – Das Beispiel des politischen Diskurses über Klimawandel. In *Indikatoren des Neuen. Innovation als Sozialmethodologie oder Sozialtechnologie?*, ed. Inka Bormann, René John and Jens Aderhold, 155-75. Wiesbaden: VS Verlag für Sozialwissenschaften.

Rammert, Werner. 1993. Der Anteil der Kultur an der Genese einer Technik: Das Beispiel des Telefons. In *Technik aus soziologischer Perspektive. Forschungsstand. Theorieansätze. Fallbeispiele. Ein Überblick,* ed. Werner Rammert, 230-8. Opladen: Westdeutscher Verlag.

Rammert, Werner. 2010. *Die Innovationen der Gesellschaft*. Technical University Technology Studies Working Papers 2/2010. Berlin.

Rammert, Werner. 2012. Distributed agency and advanced technology. Or: How to Analyze Constellations of Collective Inter-Agency. In *Agency Without Actors?: New Approaches to Collective Action*, ed. Jan-Hendrik Passoth, Birgit Peuker and Michael Schillmeier, 89-112. Abingdon and Oxon: Routledge.

Rammert, Werner, Michael Hutter, Hubert Knoblauch, and Arnold Windeler, eds. 2015. *Innovationsgesellschaft heute*. Wiesbaden: Springer VS.

Reckwitz, Andreas. 2012. *Die Erfindung der Kreativität. Zum Prozess gesellschaftlicher Ästhetisierung*. Frankfurt a. M.: Suhrkamp.

Schubert, Cornelius. 2014. *Social Innovations. Highly reflexive and multi-referential phenomena of today's innovation society?* Technical University Technology Studies Working Papers 2/2014. Berlin.

Schubert, Cornelius, and Arnold Windeler. 2007. Pfadkreationsnetzwerke aus methodischer Sicht. In *Innovationsforschung: Ansätze, Methoden, Grenzen und Perspektiven,* ed. Hagen Hof and Ulrich Wagenroth, 117-26. Hamburg: Lit.

Schulz-Schaeffer, Ingo. 2008. Technik in heterogener Assoziation: Vier Konzeptionen der gesellschaftlichen Wirksamkeit von Technik im Werk Latours. In *Bruno Latours Kollektive*, ed. Georg Kneer, Markus Schroer and Erhard Schüttpelz, 108-54. Frankfurt a. M.: Suhrkamp.

Schupp, Jürgen. 2015. Paneldaten für die Sozialforschung. In *Handbuch Methoden der empirischen Sozialforschung*, ed. Nina Baur and Jörg Blasius, 925-51. Wiesbaden: Springer Fachmedien.

Siebenhüner, Bernd. 2007. Methoden und Methodenprobleme der Innovationsforschung. In *Innovationsforschung: Ansätze, Methoden, Grenzen und Perspektiven,* ed. Hagen Hof and Ulrich Wagenroth, 103-15. Hamburg: Lit.

Smith, Keith. 2005. Measuring Innovation. In *The Oxford Handbook of Innovation*, ed. Jan Fagerberg, David C. Mowery and Richard R. Nelson, 148-77. New York: Oxford University Press.

Stark, David. 2011. *The Sense of Dissonance: Accounts of Worth in Economic Life*. Princeton: Princeton University Press.

Sydow, Jörg, Arnold Windeler, Gordon Müller-Seitz, and Knut Lange. 2012a. Path Constitution Analysis: A Methodology for Understanding Path Dependence and Path Creation. *BuR – Business Research* 5 (2): 155-76.

Sydow, Jörg, Arnold Windeler, Cornelius Schubert, and Guido Möllering. 2012b. Organizing R&D Consortia for Path Creation and Extension: The Case of Semiconductor Manufacturing Technologies. *Organization Studies* 33 (7): 907-36.

Thierbach, Cornelia, and Grit Petschick. 2015. Beobachtung. In *Handbuch Methoden der empirischen Sozialforschung*, ed. Nina Baur and Jörg Blasius, 855-66. Wiesbaden: Springer Fachmedien.

Thierbach, Cornelia, Anna Laura Raschke, Linda Hering, and Nina Baur, eds. 2014. Spatial Analysis in the Social Sciences and Humanities. Towards Integrating Qualitative, Quantitative and Cartographic Approaches. Special Issue of *Historical Social Research* 39 (2).

Van den Belt, Henk, and Arie Rip. 1987. The Nelson-Winter-Dosi model and synthetic dye chemistry. In *The Social construction of technological systems. New directions in the sociology and history of technology*, ed. Wiebe E. Bijker, Thomas Parke Hughes and Trevor J. Pinch, 135-58. Cambridge: MIT Press.

Van de Ven, Andrew H., Douglas E. Polley, Raghu Garud, and Sankaran Venkataraman. 1999. *The innovation journey*. Oxford: Oxford University Press.

Van Maanen, John. 2011. *Tales of the Field: On Writing Ethnography*, 2nd ed. Chicago: University of Chicago Press.

Vinck, Dominique, ed. 2003. *Everyday Engineering: An Ethnography of Design and Innovation*. Cambridge: MIT Press.

Vogl, Susanne. 2015. Gruppendiskussion. In *Handbuch Methoden der empirischen Sozialforschung*, ed. Nina Baur and Jörg Blasius, 581-7. Wiesbaden: Springer Fachmedien.

Voß, Jan-Peter. 2007. Innovation processes in governance: the development of 'emissions trading' as a new policy instrument. *Science and Public Policy* 34 (5): 329-43.

Weber, Max. 2004. Die Objektivität sozialwissenschaftlicher und sozialpolitischer Erkenntnis. In *Methodologie interpretativer Sozialforschung*, ed. Jörg Strübing and Bernt Schnettler, 43-100. Konstanz: UVK.

Windeler, Arnold. 2003. Kreation technologischer Pfade: Ein strukturationstheoretischer Analyseansatz. In *Strategische Prozesse und Pfade*, ed. Georg Schreyögg and Jörg Sydow, 295-328. Wiesbaden: Gabler.

Winner, Langdon. 1980. Do Artifacts Have Politics? *Daedalus* 109 (1): 121-36.

Wolf, Christof, and Henning Best, eds. 2010. *Handbuch der sozialwissenschaftlichen Datenanalyse*. Wiesbaden: VS Verlag für Sozialwissenschaften.

Zapf, Wolfgang. 1989. Über soziale Innovationen. *Soziale Welt* 40 (1/2): 170-83.